PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 598245C:JFM:RDG	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. **PCT/AU2003/001138**	International Filing Date *(day/month/year)* 4 September 2003	Priority Date *(day/month/year)* 4 September 2002

International Patent Classification (IPC) or national classification and IPC

Int. Cl. [7] A61F 2/56, 2/62, 2/70, 5/10, A61H 1/02, A63B 23/035, 23/16

Applicant

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1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of **6** sheets, including this cover sheet.

   [X] This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of **12** sheet(s).

3. This report contains indications relating to the following items:

I	[X]	Basis of the report
II	[ ]	Priority
III	[X]	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	[X]	Lack of unity of invention
V	[X]	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	[ ]	Certain documents cited
VII	[ ]	Certain defects in the international application
VIII	[ ]	Certain observations on the international application

Date of submission of the demand	Date of completion of the report
28 January 2004	14 December 2004
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer **JOHN HO** Telephone No. (02) 6283 2329

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/AU2003/001138

I. Basis of the report

1. With regard to the elements of the international application:*

- [ ] the international application as originally filed.
- [X] the description, pages **1-53,** as originally filed,
  - pages , filed with the demand,
  - pages , received on with the letter of
- [X] the claims, pages , as originally filed,
  - pages , as amended (together with any statement) under Article 19,
  - pages , filed with the demand,
  - pages **54-65** , received on **29 November 2004** with the letter of **26 November 2004**
- [X] the drawings, pages **1/53-53/53,** as originally filed,
  - pages , filed with the demand,
  - pages , received on with the letter of
- [ ] the sequence listing part of the description:
  - pages , as originally filed
  - pages , filed with the demand
  - pages , received on with the letter of

2. With regard to the **language,** all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:

- [ ] the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- [ ] the language of publication of the international application (under Rule 48.3(b)).
- [ ] the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- [ ] contained in the international application in written form.
- [ ] filed together with the international application in computer readable form.
- [ ] furnished subsequently to this Authority in written form.
- [ ] furnished subsequently to this Authority in computer readable form.
- [ ] The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- [ ] The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. [ ] The amendments have resulted in the cancellation of:
   - [ ] the description, pages
   - [ ] the claims, Nos.
   - [ ] the drawings, sheets/fig.

5. [ ] This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/AU2003/001138

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be nonobvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos: **38 and 39**

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination *(specify)*:

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☒ no international search report has been established for said claim Nos. **38 and 39**

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

   ☐ restricted the claims.

   ☐ paid additional fees.

   ☐ paid additional fees under protest.

   ☐ neither restricted nor paid additional fees.

2. ☒ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

   ☐ complied with.

   ☒ not complied with for the following reasons:

   See explanation on supplemental sheet.

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

   ☐ all parts.

   ☒ the parts relating to claims Nos. **1-37**

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims **1-37**	**YES**
	Claims -	**NO**
Inventive step (IS)	Claims **1-37**	**YES**
	Claims -	**NO**
Industrial applicability (IA)	Claims **1-37**	**YES**
	Claims -	**NO**

2. Citations and explanations (Rule 70.7)

The following documents identified in the International Search Report have been considered for the purposes of this report:

D1 – WO 2000/015157
D2 – US 5556700
D3 – EP 924033
D4 – EP 421368
D5 – US 5103807
D6 – JP 2001-46450
D7 – US 3756222
D8 – US 4246661

The broadest aspect of the present invention relates to a device and/or method for facilitating movement of at least one joint of a patient's body. This involves the use of an actuator capable of causing the joint to move, operating means coupled to the actuator for operating the actuator in response to an input signal, sensor coupled to the operating means and capable of providing to the operating means at least one feedback signal relating to at least one quantity of the joint so as to affect the operation of the actuator and a support structure coupled to the actuator and the patient's body wherein the support structure is so disposed so that the actuator is capable of causing the joint to move. These features are not disclosed by the cited documents.

The closest art, D1, discloses a prosthetic device for replacing a patient's limb or joint. This citation does not disclose a device for facilitating movement of the joint of a patient's body.

Citations D4-D7 each discloses a device for facilitating movement of a patient's joint/limb. However, these citations fail to disclose the use of a sensor for providing feedback signals relating to at least one quality of the joint so as to affect the operation of the actuator.

Therefore the subject matter of claims 1-37 is new and meets the requirements of Article 33(2) PCT with regard to novelty.

The claimed invention is also not obvious in light of any of the cited documents nor is it disclosed in any obvious combination of them. It is also considered that it would not be obvious to a person skilled in the art in the light of common general knowledge either by itself or in combination with any of these documents.

The claims are related to products capable of commercial application.

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of Box IV

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1-37 are directed to a device and/or method for facilitating movement of at least one joint of a patient's body. It is considered that the use of an actuator capable of causing the joint to move, operating means coupled to the actuator for operating the actuator in response to an input signal, sensor coupled to the operating means and capable of providing to the operating means at least one feedback signal relating to at least one quantity of the joint so as to affect the operation of the actuator and a support structure coupled to the actuator and the patient's body wherein the support structure is so disposed so that the actuator is capable of causing the joint to move comprises a first "special technical feature".

2. Claim 38 is directed to a sensing device. It is considered that the use of a sensor comprising of a transducer having a radiation source, one or more detectors capable of detecting radiation from the radiation source and a return mechanism coupled to one or more detectors wherein each of the one or more detectors is capable of generating a feedback signals dependent on an intensity of the radiation incident on the detector; and a support structure coupled to the sensor and the patient's body comprises a second special technical feature.

3. Claim 39 is directed to a force-position transducer. It is considered that the use of a radiation source and one or more detectors wherein each of the one or more detectors is capable of detecting radiation from the radiation source, and a return mechanism coupled to the detectors for generating a signal dependent on an intensity of the radiation incident on the detector comprises a third special technical feature.

Since the abovementioned groups of claims do not share any of the technical features identified, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Accordingly the international application does not relate to one invention or to a single inventive concept, a priori.

It is also noted that the second and third inventions identified above were not searched at the International Search Report stage.

CLAIMS

1. A movement facilitation device for facilitating movement of at least one joint of a patient's body, said device comprising:

a) an actuator capable of causing the joint to move;

b) operating means coupled to the actuator for operating the actuator in response to an input signal;

c) a sensor coupled to the operating means, said sensor being capable of providing to the operating means at least one feedback signal relating to at least one quantity selected from the group consisting of a force exerted on the joint, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint, so as to affect the operation of the actuator; and

d) a support structure coupled to the actuator and capable of being coupled to the patient's body such that, when coupled to the patient's body, the support structure is disposed so that the actuator is capable of causing the joint to move.

2. A movement device for facilitating movement of a joint of a patient's body, said device comprising:

a) a movement facilitation device comprising:

an actuator capable of causing the joint to move,

operating means coupled to the actuator for operating the actuator in response to an input signal,

a sensor capable of providing at least one feedback signal relating to at least one quantity selected from the group consisting of a force exerted on the joint, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint, and

a support structure coupled to the actuator and capable of being coupled to the patient's body such that, when coupled to the patient's body, the support structure is disposed so that the actuator is capable of causing the joint to move; and

b) controlling means capable of providing the input signal to the operating means for controlling the operating means;

wherein the sensor is capable of providing the at least one feedback signal to means selected from the operating means and the controlling means so as to affect the operation of the actuator.

3. The movement device of claim 2 wherein the actuator is capable of causing the joint to move in a pivotal manner.

4. The movement device of claim 2 wherein the support structure is capable of being coupled to the patient's body proximate the joint.

5. The movement device of claim 2 wherein the support structure is coupled to the actuator by a cable.

6. The movement device of claim 5 wherein the cable passes over a knuckle such that, in use, the knuckle is located on top of the joint for providing mechanical advantage to the cable.

7. The movement device of claim 5 wherein at least a portion of the cable is located within a tube, said tube being associated with the support structure.

8. The movement device of claim 2 wherein the actuator comprises one of a motor, a material which changes shape when an electrical potential thereacross is altered, a material which contracts when operated and a material which when operated decreases in length.

9. The movement device of claim 2 wherein the actuator comprises a material which changes shape when an electrical potential thereacross is altered, said actuator being capable of incremental actuation.

10. The movement device of claim 2 additionally comprising securing means for securing the support structure to the patient's body.

11. The movement device of claim 2 wherein the support structure comprises a glove for enveloping at least a portion of the patient's body proximate the at least one joint.

12. The movement device of claim 2 wherein the support structure comprises a first member positioned so as not to interfere with an ability of the at least one joint to move, said first member being located in a position selected from the group consisting of on top of the joint and at the side of the joint.

13. The movement device of claim 2 wherein the actuator comprises at least one ratchet capable of allowing movement in one direction and of restricting movement in the opposite direction, to enable incremental actuation.

14. The movement device of claim 2 wherein the sensor comprises a force-position transducer for generating the at least one feedback signal.

15. The movement device of claim 14 wherein the transducer comprises:

a) a radiation source and one or more detectors capable of detecting radiation from the radiation source, and

b) a return mechanism coupled to the one or more detectors,

wherein each of the one or more detectors is capable of generating one of the at least one feedback signals, wherein said feedback signal is dependent on an intensity of the radiation from the radiation source incident on said detector, said feedback signal relating to at least one quantity selected from the group consisting of a force exerted on the joint, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint.

16. The movement device of claim 15 wherein the radiation is selected from the group consisting of light, infra-red, magnetic, ultrasonic and electromagnetic radiation.

17. The movement device of claim 2 additionally comprising a lock for locking the joint in a fixed position.

18. The movement device of claim 2 having means to set a safety limit, said means being selected from the group consisting of a safety force release for setting a safety limit for force applied to the joint and an adjustable mechanical stopper for setting a safety limit for position of the joint.

19. The movement device of claim 2 having software in said controlling means, said software having a settable safety limit for at least one of the position of the joint and the force applied to the joint.

20. The movement device of claim 2 comprising a plurality of movement facilitation devices wherein the controlling means is capable of providing input signals to the operating means of each of the movement facilitation devices for controlling said operating means.

21. The movement device of claim 20 wherein the controlling means is capable of controlling the movement facilitation devices in a manner selected from the group consisting of independently and so as to work together towards specific aims.

22. The movement device of claim 2 having a first and a second movement facilitation device which can work in opposition to one another, said first and second movement facilitation devices being capable of being coupled to the patient's body proximate the same joint, wherein the first movement facilitation device, when operated, flexes the joint, and the second movement facilitation device, when operated, extends the joint.

23. The movement device of claim 2 wherein a single movement facilitation device is capable of flexing and of extending the joint.

24. The movement device of claim 2 comprising movement facilitation devices capable of being coupled to a limb or digit of the patient, so as to facilitate independent movement of at least two joints of said limb or digit.

25. The movement device of claim 2 wherein the controlling means comprises a computer adapted to receive the at least one feedback signal from the sensor and to use the at least one feedback signal to provide the input signal to the operating means.

26. Use of a movement device according to claim 2 to maintain and increase good condition of a person's hand and hand function following one or more events selected from the group consisting of spinal cord injury, burns, stroke, the onset of arthritis, septic arthritis, oedema, peripheral nerve injury and other syndromes influencing the condition or function of the upper extremity, including cerebral palsy, hand trauma and hand surgery, said use comprising the step of causing the movement device to move, thereby causing at least one joint of the person's hand to move.

27. A system for applying Continuous Passive Motion therapy to a joint of a patient, comprising:

a) an actuator capable of causing the joint to move,

b) operating means coupled to the actuator for operating the actuator in response to an input signal,

c) a sensor capable of providing at least one feedback signal relating to a quantity selected from the group consisting of a force exerted on the joint, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint,

d) a support structure coupled to the actuator and capable of being coupled to the patient's body such that, when coupled to the patient's body, the support structure is disposed so that the actuator is capable of causing the joint to move,

e) controlling means capable of providing the input signal to the operating means for controlling the operating means;

f) a control system comprising a user interface, said control system being coupled to the controlling means in order to provide user input to the controlling means; and

g) a power supply for supplying power to at least one of the controlling means and the operating means,

wherein the sensor is capable of providing the at least one feedback signal to means selected from the operating means and the controlling means so as to control the operation of the actuator.

28. A method for causing flexion or extension of a joint of a patient, said method comprising:

a) securing to at least a portion of the patient's body proximate the joint a movement device comprising:

an actuator capable of causing the joint to move,

operating means coupled to the actuator for operating the actuator in response to an input signal,

a sensor capable of providing at least one feedback signal relating to a quantity selected from the group consisting of a force exerted on the joint, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint,

a support structure coupled to the actuator and capable of being coupled to the patient's body such that, in use, the support structure is disposed so that the actuator is capable of causing the joint to move, and

controlling means capable of providing the input signal to the operating means for controlling the operating means,

wherein the sensor is capable of providing the at least one feedback signal to means selected from the operating means and the controlling means so as to control the operation of the actuator; and

b) operating the operating means whereby the actuator causes the joint to flex or extend.

29. The method of claim 28 comprising:

c) passing the at least one feedback signal to the controlling means,

d) determining said quantity using the controlling means,

e) using said quantity to generate the input signal, and

f) providing the input signal to the operating means by means of the controlling means for a purpose selected from the group consisting of controlling speed and range of movement of the joint, controlling a force applied to the joint, controlling the position so that a position limit is not exeeded and controlling the force so that a maximum force limit is not exceeded.

30. A method for splinting a joint of a patient, said method comprising:

a) securing to at least a portion of the patient's body proximate the joint a movement device comprising:

an actuator capable of causing the joint to move,

operating means coupled to the actuator for operating the actuator in response to a first input signal,

a sensor capable of providing at least one feedback signal relating to a quantity selected from the group consisting of a force exerted on the joint, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint,

a support structure coupled to the actuator and capable of being coupled to the patient's body such that, when coupled to the patient's body, the support structure is disposed so that the actuator is capable of causing the joint to move, and

controlling means capable of providing the first input signal to the operating means for controlling the operating means,

wherein the sensor is capable of providing the at least one feedback signal to means selected from the operating means and the controlling means so as to control the operation of the actuator, said movement device being capable of flexing and of extending the joint;

b) operating the operating means whereby the actuator causes the joint to move the joint to a desired position; and

c) providing a second input signal to the operating means such that the actuator splints the joint.

31. A method for splinting a joint of a patient, said method comprising:

a) securing to at least a portion of the patient's body proximate the joint a movement device comprising a first movement facilitation device and a second movement facilitation device which can work in opposition to one another, wherein the first movement facilitation device, when operated, flexes the joint, and the second movement facilitation device, when operated, extends the joint, each of said movement facilitation devices comprising:

an actuator capable of causing the joint to move,

operating means coupled to the actuator for operating the actuator in response to an input signal,

a sensor capable of providing at least one feedback signal relating to a quantity selected from the group consisting of a force exerted on the joint, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint, and

a support structure coupled to the actuator and capable of being coupled to the patient's body such that, when coupled to the patient's body, the support structure is disposed so that the actuator is capable of causing the joint to move,

and said movement device also comprising controlling means capable of providing an input signal to the operating means of each movement facilitation device for controlling the operating means thereof, wherein the sensor is capable of providing the at least one feedback signal to means selected from the operating means and the controlling means so as to control the operation of the actuator, said movement device being coupled to at least a portion of the patient's body proximate the joint;

b) operating the operating means of the movement facilitation devices thereby operating the actuators of the first and second movement devices so that the first movement facilitation device and the second movement facilitation device work in opposition to one another to apply an equal and opposite force in order to splint the joint.

32. A method for flexing a first joint of a limb of a patient while splinting a second joint of the limb, comprising:

a) securing to the limb proximate the first and second joints a movement device comprising a first and a second movement facilitation device wherein the first movement facilitation device is secured to the limb proximate an end thereof such that, when operated, it flexes both the first joint and the second joint, and the second movement facilitation device, when operated, extends the second joint, each of said movement facilitation devices comprising:

an actuator capable of causing the joint to move,

operating means coupled to the actuator for operating the actuator in response to an input signal,

a sensor capable of providing at least one feedback signal relating to a quantity selected from the group consisting of a force exerted on the joint, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint, and

a support structure coupled to the actuator and capable of being coupled to the patient's body such that, when coupled to the patient's body, the support structure is disposed so that the actuator is capable of causing the joint to move,

and said movement device also comprising controlling means capable of providing an input signal to the operating means of each movement facilitation device for controlling the operating means, wherein the sensor is capable of providing the at least one feedback signal to means selected from the operating means and the controlling means so as to control the operation of the actuator;

b) operating the operating means of the second movement facilitation device thereby causing the actuator of the second movement facilitation device to extend the second joint; and

c) operating the operating means of the first movement facilitation device so as to flex the first joint and not flex the second joint.

33. A method for splinting a joint of a patient, said method comprising:

a) securing to at least a portion of the patient's body proximate the joint a movement device comprising:

an actuator capable of causing the joint to move,

operating means coupled to the actuator for operating the actuator in response to an input signal,

a sensor capable of providing at least one feedback signal relating to a quantity selected from the group consisting of a force exerted on the joint, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint,

a support structure coupled to the actuator and capable of being coupled to the patient's body such that, when coupled to the patient's body, the support structure is disposed so that the actuator is capable of causing the joint to move; and

controlling means capable of providing an input signal to the operating means for controlling the operating means,

wherein the sensor is capable of providing the at least one feedback signal to means selected from the operating means and the controlling means so as to control the operation of the actuator, said movement device having a feature that allows locking of the joint once a desired posture is reached, and said feature being located in a location selected from the group consisting of at the actuator and at the joint, and said feature being selected from the group consisting of a feature that allows mechanical locking, a press-lock, a manually actuated lock and an actuator operated lock; and

b) operating the operating means whereby the actuator causes the joint to move the joint to a desired position; and

c) locking the joint by means of the feature that allows locking.

34. A method for facilitating grasping motion of a hand of a patient comprising:

a) securing to the hand a movement device, said movement device comprising controlling means capable of providing input signals to a plurality of movement facilitation devices, each of said movement facilitation devices being coupled

to the hand proximate a joint of the hand, and each of said movement facilitation devices comprising:

an actuator capable of causing the joint to move,

operating means coupled to the actuator for operating the actuator in response to an input signal,

a sensor capable of providing at least one feedback signal relating to a quantity selected from the group consisting of a force exerted on the joint, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint, said the sensor being capable of providing the at least one feedback signal to means selected from the operating means and the controlling means so as to control the operation of the actuator and

a support structure coupled to the actuator and capable of being coupled to the patient's body such that, when coupled to the patient's body, the support structure is disposed so that the actuator is capable of causing the joint to move;

b) programming the controlling means to cause the hand to adopt an open position;

c) programming the controlling means with at least one of: an order of operation of joints, a degree of flexion for each joint, a range of motion for each joint, a strength of movement, and a speed of overall hand closure; and

d) operating the actuators by means of the input signals from the programmed controlling device in order to facilitate grasping motion.

35. A method for applying Continuous Passive Motion Therapy to a joint of a patient, comprising:

a) securing a movement device to the patient's body proximate the joint, said movement device comprising controlling means capable of providing an input signal to a movement facilitation device, said movement facilitation device comprising:

an actuator capable of causing the joint to move,

operating means coupled to the actuator for operating the actuator in response to an input signal,

a sensor capable of providing to means selected from the operating means and the controlling means at least one feedback signal relating to a quantity selected from the group consisting of a force exerted on the joint, a

force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint, and

a support structure coupled to the actuator and capable of being coupled to the patient's body such that, when coupled to the patient's body, the support structure is disposed so that the actuator is capable of causing the joint to move;

b) programming the controlling means with a program for controlling the movement device to perform a cycle comprising flexion and extension of the joint between 1 and 10000 times; and

c) causing the controlling device to run the program.

36. A method for determining at least one parameter selected from the group consisting of an applied force provided to a joint of a patient, an applied force provided by the joint, a pressure provided to the joint, a pressure applied by the joint and a position of the joint comprising:

a) securing to at least a portion of the patient's body proximate the joint a movement device comprising:

an actuator capable of causing the joint to move,

operating means coupled to the actuator for operating the actuator in response to an input signal,

a sensor capable of providing at least one feedback signal relating to a quantity selected from the group consisting of a force exerted on the joint, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint,

a support structure coupled to the actuator and capable of being coupled to the patient's body such that, when coupled to the patient's body, the support structure is disposed so that the actuator is capable of causing the joint to move, and

controlling means coupled to the operating means for controlling the operating means;

b) applying a force by or to the joint of the patient; and

c) determining from the feedback signal at least one of the applied force provided to the joint, the applied force provided by the joint, the pressure provided to the joint, the pressure applied by the joint and the position of the joint.

37. A method for monitoring at least one parameter selected from the group consisting of the position of a joint and a force exerted by the joint comprising:

a) securing to at least a portion of the patient's body proximate the joint a movement device comprising:

an actuator capable of causing the joint to move,

operating means coupled to the actuator for operating the actuator in response to an input signal,

a sensor capable of providing at least one feedback signal relating to a quantity selected from the group consisting of a force exerted on the joint, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint,

a support structure coupled to the actuator and capable of being coupled to the patient's body such that, when coupled to the patient's body, the support structure is disposed so that the actuator is capable of causing the joint to move, and

controlling means coupled to the operating means for controlling the operating means,

wherein the sensor comprises a transducer comprising a radiation source and one or more detectors capable of detecting radiation from the radiation source, and a return mechanism coupled to the one or more detectors, wherein each of the one or more detectors is capable of generating one of the at least one feedback signals, wherein said feedback signal is dependent on an intensity of the radiation incident on said detector;

b) causing the joint to apply a force;

c) monitoring the intensity of the intensity of radiation incident on the or each detector; and

d) using the intensity of radiation to determine at least one parameter selected from the group consisting of the position of the joint and the force exerted by the joint.

38. A sensing device for sensing a quantity selected from the group consisting of a force exerted on a joint of a patient's body, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint, said device comprising:

a) a sensor capable of providing a signal relating to a quantity selected from the group consisting of a force exerted on the joint, a force exerted by the joint, a position of the joint, a pressure exerted on the joint and a pressure exerted by the joint, said sensor comprising a transducer comprising a radiation source, one or more detectors capable of detecting radiation from the radiation source and a return mechanism coupled

to the one or more detectors, wherein each of the one or more detectors is capable of generating a feedback signals dependent on an intensity of the radiation incident on said detector; and

b) a support structure coupled to the sensor and capable of being coupled to the subject's body such that, when coupled to the patient's body, the support structure is disposed so that the sensor is capable of providing a signal relating to the quantity.

39. A force-position transducer comprising:

a) a radiation source and one or more detectors capable of detecting radiation from the radiation source, and

b) a return mechanism coupled to the one or more detectors,

wherein each of the one or more detectors is capable of generating a signal dependent on an intensity of radiation from the radiation source incident on said detector.